DOCUMENT RESUME

ED 179 555 TM 009 750

AUTHOR Connolly, John A.; McGrail, Janet
TITLE School Variables Affecting Student Learning. Draft.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE 1 Mar 78
NOTE 67p.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Academic Achievement; Class Management; Classroom Environment; Course Content; Effective Teaching; Elementary Education; Elementary School Curriculum; *Institutional Characteristics; Instructional Materials; Learning; Performance Factors; Predictor Variables; *Research Design; Research Needs; Student Characteristics; Student Teacher Relationship; Teacher Characteristics; Time Factors (Learning)
IDENTIFIERS Aptitude Treatment Interaction

ABSTRACT

An attempt is made to consolidate some of the existing knowledge about important school variables and to propose new studies that will build upon that knowledge. The focus is on providing instruction to students from the orientation of educational psychology and in the context of elementary schools for students from low socioeconomic status groups. A tentative list of twenty variables is categorized in eight categories: time, instructional articulation, teacher characteristics, instructional integration, instructional organization, teacher/student interactions, classroom control, and instructional materials. The rationale for these variables and categories is presented, based on educational utility and research support. Procedures for measuring variables are suggested. The operation of these variables is explained with reference to a chart relating school district variables, school variables, teacher characteristics, classroom variables, student characteristics, student mental processes, and student learning outcomes. The final section discusses research strategy, generally recommending a number of comparatively small studies aimed at indicating relationships rather than testing hypotheses, and taking into account the possible complex interrelationships that may exist between variables. (Author/CTM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED179555

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

SCHOOL VARIABLES AFFECTING STUDENT LEARNING

John A. Connolly and Janet McGrail

Research for Better Schools, Inc.

DRAFT

March 1, 1978

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
John A. Connally
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

TM 009 750

The preparation of this paper was supported by funds from the National Institute of Education (NIE), United States Department of Health, Education, and Welfare. The opinions expressed do not necessarily reflect the position or policy of NIE, and no official endorsement should be inferred.

TABLE OF CONTENTS

	Page
INTRODUCTION	2
DESCRIPTION OF SCHOOL VARIABLES	6
OPERATION OF SCHOOL VARIABLES	31
IMPLICATIONS FOR RESEARCH	41
REFERENCES	56
APPENDIX	60

SCHOOL VARIABLES AFFECTING STUDENT LEARNING

A number of studies conducted over the past decade or so have been aimed at determining if differences in schooling make a difference in what students learn. Several large-scale studies (e.g., Averch et al., 1972; Coleman et al., 1966; Mayeske et al., 1969) have suggested that measurable differences between schools are only slightly related to student learning. However, some more recent work on school effects (e.g., McDonald, 1976; Stallings, 1973; Wiley and Harnischfeger, 1974) has shown stronger relationships between various aspects of schooling and student learning outcomes. One reason why some of the more recent findings differ from earlier ones may be that later work has tended to focus on what happens at the classroom level. That is, the classroom rather than the school has been the unit of analysis.

The results of studies centering on the classroom, along with the in-school experiences of educators and researchers alike, provide support for the notion that school differences are significantly related to outcomes. They also suggest that additional work should be directed toward the definition of specific variables that are effective in promoting learning and the identification of specific conditions under which these variables are most effective.

The main assumption underlying the preparation of this paper is that school differences do affect student learning. It is recognized, though, that the effects of schooling are somewhat limited. The single most important influence on learning outcomes is probably students'

initial abilities. In comparison with the effects of initial abilities, the contribution of school variables is likely to be quite small. It is recognized, too, that a number of other influences affect learning. The home, community, and peer group are examples of these additional influences. Nevertheless, school variables are viewed as having enough impact on learning to warrant study and improvement.

INTRODUCTION

This paper represents an initial attempt to consolidate some of the existing knowledge about important school variables and to propose new studies that will build upon the findings of previous work. School variables refer to those characteristics of the school district, school building, classroom, and teacher that appear to influence learning and that can be defined, assessed, and improved should weaknesses be detected. Three questions concerning school variables are addressed in this paper:

- What school variables are important influences on student learning?
- How do these variables influence learning?
- What kinds of research can be undertaken to add to existing knowledge about important variables and how they operate in school settings?

Answers to the first two of these questions could be useful in school improvement efforts. Schools could examine their programs in terms of the variables tentatively identified as important, then take appropriate steps to correct any deficiencies that are indicated. These steps might include changes in curricula, teacher training,

classroom management schemes, or administrative procedures. However, the existing knowledge base is not sufficient to support widespread school improvement efforts. For this reason, only tentative answers are supplied to the first two questions and a research program is suggested in response to the third question in order to add to existing knowledge.

In attempting to identify potentially important school variables, the focus here has been on one function of schools — to provide instruction to students. Schools, however, do serve other functions. Etzioni (1960), for instance, suggests that a significant portion of the resources of any institution is necessarily devoted to organizational maintenance functions. That is, schools and teachers are concerned not only with their role in instruction but also with a variety of other functions, such as maintaining a favorable image of the school in the minds of parents and the community in general. Thus, the school variables discussed in this paper are only a part of a much larger set of conditions that might contribute to a broad definition of "quality in education."

It is possible to analyze the instructional function of schools from a number of different perspectives. As an example, Doyle (in press, b) identifies three perspectives or paradigms for research on teacher effectiveness: the process-product, mediating process, and classroom ecology models. Similarly, Barr and Dreeben (in press) argue the case for a better understanding of the social context in schools and classrooms and the influence of contextual variables on student learning. The important point here is that different conclusions about variables

contributing to student learning will probably be reached by educational psychologists, cognitive psychologists, anthropologists, sociologists, economists, and any other group that is concerned with school effects. As a result, it is important to note at the outset the perspective used in the present analysis.

The dominant orientation represented here is that of educational psychology. However, a conscious effort has been made to examine at least some aspects of the social context of school settings as well as the ecology of classrooms. This broader perspective is most clearly evident in the attempt to view the classroom teacher as a manager of a large group of students in a complex social setting rather than as simply a tutor of individual children. Viewing the teacher in this larger context leads to consideration of such issues as classroom management procedures and classroom control techniques.

One caution needs to be made before turning to a description of school variables identified as potentially important. The research and experience that suggested these variables as possible influences on learning are limited in terms of level of the educational system, characteristics of students, and type of outcome. That is, the knowledge base from which variables were identified was built primarily through efforts involving elementary schools, students from low socio-economic status (SES) groups, and cognitive outcomes, particularly basic reading and mathematics skills. Thus, generalizations that involve secondary schools, students from middle or high SES groups, and noncognitive outcomes may be inappropriate.

The remainder of this paper is divided into three sections. The first of these sections describes twenty school variables that appear to influence student learning outcomes. The following section discusses the ways in which these variables seem to affect learning. The final section proposes a program of research that is designed to contribute to existing knowledge about important school variables and how they function in actual school settings.

As indicated earlier, this paper is a first attempt to structure existing knowledge in the highly complex area of school effects. It is expected that the paper will be revised over the coming years to reflect the results of any new research undertaken, as well as the experiences of educators and researchers who conduct field work in school settings.

DESCRIPTION OF SCHOOL VARIABLES

The major school variables that have been tentatively identified as important influences on student learning outcomes are described in this section. In order to provide further clarification of these variables, they are grouped in terms of eight factors. These factors are: Time, Instructional Articulation, Teacher Characteristics, Instructional Integration, Instructional Organization, Teacher/Student Interactions, Classroom Control, and Instructional Materials.

Before describing each of the variables, an important question about the criteria that were used in their selection needs to be discussed: How were these variables selected from hundreds that have been examined in relation to cognitive learning outcomes? Two basic criteria were used: educational utility and research support.

- Educational Utility. The primary criterion for inclusion in the present list is the utility of the concept for helping schools improve their educational programs. Educational utility is defined as consisting of three essential features: (1) educators can understand the description of the variable and relate it to an aspect of their local educational program; (2) educators can analyze their programs in terms of the variable and can make the improvements suggested; and (3) educators feel that such improvements may result in improved student learning.

  The process that was used to develop a list of variables and to test their educational utility in the field consisted of three steps. First, a preliminary list was prepared on the basis of the authors' experiences in working with schools on local improvement projects, the findings of major research studies, and the ideas of teachers and other educators in the field. Second, the variables were defined, measures of each variable were developed, and these variables and measures were used

as a basis for analyzing educational programs and suggesting directions for improvement efforts in fifteen schools participating in a statewide improvement project (Pennsylvania School Improvement Program). Third, changes and additions to the original list were made on the basis of this work in schools, and the present list was prepared. This process ensured that all of the variables on the list have demonstrated some utility for helping schools improve their educational programs.

- Research Support. After a list of educationally useful variables was prepared, the research literature was reviewed a second time in order to sharpen the definition of each variable and to identify additional research support for its validity. Although research support was found for many of the variables (and cited in the paper), the research results are by no means conclusive. Research support was not found in the literature for some of the variables (e.g., interrelationship of instruction across grades). Their inclusion on the present list is based solely on our judgment and the judgment of educators in the field.

In brief, all of the variables discussed here were selected primarily because of their utility for school improvement projects. Most are also supported by research, but the research findings are inconclusive. All of the variables should be viewed as possible influences on student learning. The research needed to verify or revise the present list is discussed in the final section of this paper.

The remainder of this section describes eight factors and the twenty school variables that make up these factors. Each factor is defined, the variables grouped under each factor are described, and some of the available research that supports the importance of these variables is noted. Procedures for measuring variables are suggested, as well as ways in which they might be strengthened as part of a school improvement effort. A summary list of variables tentatively identified as important is included in the Appendix to this paper.

Time

Most educators would accept the simple proposition that children who spend more time in learning-related activities tend to learn more. However, time is often not treated as a resource that can be manipulated to improve student learning, since educators tend to think of time as a necessary but not a sufficient condition for learning. That is, they generally feel that it is not only the quantity but also the quality of time spent in a learning situation that determines a student's progress.

Recent research has begun to focus attention on both quantitative and qualitative aspects of the time concept. Thus, the literature in this area is beginning to offer some guidance to schools not only about the importance of how much time is made available for student learning but also about more effective ways to use time. For example, the overall importance of time-to-learn has been repeatedly emphasized by Carroll (1963) and Bloom (1974). In addition, a number of studies have shown significant correlations between student learning and the following variables: a longer school day (Bond and Dykstra, 1967), number of days of student and teacher absence (Rosenshine, 1971), average number of hours of schooling (Wiley and Harnischfeger, 1974), and amount of time spent on academic activities (Stallings and Kaskowitz, 1974). Moreover, the importance of active engagement on the part of both teachers and students in the instructional process is often emphasized.

Based on this research, the broad concept of time is defined as the extent to which time is used as a resource to provide maximum opportunity

for student learning. Three variables are included under the concept of time:

- Time in School. Wiley and Harnischfeger (1974) indicated that the total number of hours of schooling provided in a school year seems to vary a great deal from one school or school district to another, and these differences are correlated with student achievement. Could a school simply increase the average number of hours of schooling provided in a school year in order to improve student learning? Although a definitive answer to this question is not presently available, it does seem safe to assume that increases in the total amount of school time would at least provide more opportunity for student learning. However, these quantitative increases in time should be viewed as part of a larger program designed to improve the quality of usage of the time made available for instruction.

- Time Assigned to Academic Activities. Some proportion of the instructional time in every school is allocated to instruction in academic areas (e.g., reading, math, social studies), and the rest to non-academic areas (e.g., arts and crafts, music). Since student learning in a particular subject-matter area seems to be related to the amount of time spent in that area (Stallings and Kaskowitz, 1974), a school might assign more instructional time to an area of particular importance or to an area where student performance is relatively poor. Additional time for instruction might be obtained by increasing the total time in school or by decreasing the time allocated to a non-academic subject area.

- Instructional Time. Increasing the amount of time in school or assigning more time to a particular subject area will not automatically result in improved student learning unless more time is actually spent in instructional activities at the classroom level.* As will be noted in discussing the issue of classroom

---

* This variable deals with teacher time-on-task. However, the ultimate objective is to increase the amount of time that students spend on learning-related tasks. This student time-on-task concept is excluded from the present discussion because of our focus on school variables.

> control, much of the time spent in class is devoted to management activities and disciplinary actions rather than instruction. According to LeCompte (in press), 50 to 60 percent of the teacher/student interactions in a classroom are not related to content but rather to spelling out rules or limiting behavior, flagging the start or end of activities, giving orders, or reprimanding students. Although all of these activities are necessary to some extent, it is important that they be kept to a minimum and that teacher time-on-task be maximized.

Measurement of the time concept can be accomplished in several ways. Data on time in school and time assigned to academic activities can be obtained fairly easily from school administrators or teachers. Instructional time is more difficult to measure. Teachers can provide estimates of the time they spend on task, but more accurate data can be gathered through observations of classroom activities.

Our analysis suggests that improved student learning might result from increasing the amount of time in a school year or a school day, or from assigning more time to instruction in a particular subject area. However, the most important consideration might be to take steps to ensure that teachers spend more time on instruction-related activities. Increasing teacher time-on-task may be a function of achieving better classroom control, or improved organization of instruction, or more effective use of instructional materials. In this sense, time may be a concept that cuts across many of the variables to be discussed in this paper. The pervasive influence of time on student achievement is developed in a model of "Individual Instructional Exposure and Achievement" (Wiley and Harnischfeger, 1974).

Instructional Articulation

From the student's point of view, schooling involves continuous movement from one subject or class to another, and from one grade level to the next. However, the instructional program he or she encounters in different subjects, classes, or grades may be anything but continuous. The arithmetic program at the fifth-grade level, for example, may directly duplicate rather than extend previous learning in earlier grades. As a result, students will probably not be adequately prepared for sixth-grade arithmetic instruction. In addition, they may have difficulty in other subject-matter areas at the same grade level. For instance, they may not be able to do the computation work required in a fifth-grade science experiment. Further, work in science may not be designed to reinforce the arithmetic skills that are learned.

Instructional articulation is defined as the extent to which instruction at one grade level or content area supports instruction in other grade levels or content areas. Two variables are included under this factor:

- Interrelationship of Instruction Across Grades. The simple presence (or absence) of a school-wide plan for relating instruction across grade levels is one basic indication of the level of articulation of instruction in a school. At a minimum, the school plan should present the goals of instruction for each grade, describe the scope and sequence of instruction for each grade at least in general terms, and provide some indication of the kinds of measures to be used to assess student outcomes. Furthermore, the plan should be periodically updated to reflect changes in specific instructional programs (e.g., the addition of a new reading series).

An important characteristic of the plan is the extent to which instruction at one grade level provides opportunities for reinforcing the instruction provided previously. Also of concern is the extent to which instruction lays the foundation for subsequent instruction. This level of articulation requires careful planning for transitions from one grade level to another to ensure that students have prerequisite skills or further opportunities to acquire them. In addition, provisions should be made for relearning certain critical skills in different grade levels.

A school-wide plan is useless unless teachers are aware of its existence and relate their instructional activities to the overall plan. All teachers in the school should be aware of the content of the plan, thoroughly familiar with the specifications for their subject-matter field across the various grade levels, and provide instruction that is integrated with the instruction received in both lower and upper grades.

- Interrelationship of Instruction Across Content Areas. Another aspect of instructional articulation is the extent to which instruction across content areas within a particular grade level is coordinated to provide maximum opportunity for student learning. This kind of coordination should also be specified in the overall school plan. However, in this case, the focus of interest shifts from the quality of planning across grade levels to the extent of planning across related content areas at a particular grade level. This kind of articulation requires detailed planning for reinforcing the development of certain critical skills (e.g., reading) in different content areas at the same grade level. Moreover, teachers in different content areas need to be made aware of the overall plan and use it in developing classroom instructional activities.

Implied in these two variables is the notion that the instructional program of the individual classroom teacher is part of a larger instructional plan for the entire school. Thus, any effort to measure or strengthen program articulation requires school-level data collection and planning involving administrators and teachers from various grade

levels. The first task of this planning group might be to assess the strengths and weaknesses of the existing school plan by gathering information from administrators and teachers as well as from students. This base of information can then be used for planning improved programs.

Instructional articulation is viewed as an important feature of educational programs by many educators participating in school improvement projects. Nevertheless, no research studies have been identified that show a clear relationship between a high level of program articulation and increased student learning. Consequently, the variables that constitute this factor may be viewed by some as less credible or valid than others reviewed in this paper.

Teacher Characteristics

Researchers and educators have reasoned that what a teacher knows, or feels, or thinks may affect student learning, at least to some degree. Centra and Potter (1977), however, point out that teacher characteristics do not affect student learning directly. Knowledge, feelings, or understandings tend to influence the teacher's behavior, which, in turn, may affect student learning. Thus, for example, knowledge of a particular subject area (e.g., reading) may influence the teacher's behavior in activities such as organization of the instructional program, integration of instruction, or interactions with students. In this sense, teacher characteristics, like the concepts of time and instructional articulation, influence some of the other variables to be discussed later in this paper and only indirectly affect student learning.

The factor labeled teacher characteristics is defined as the degree to which the attitudes, expectations, and expertise of the teaching staff tend to facilitate student learning. Three variables constitute this factor:

- Attitudes. The teachers' attitudes about the nature and quality of the instructional program may be one characteristic that affects student learning. This variable is defined as the extent of teacher agreement with the overall philosophy of the school, the goals of instruction, the instructional content and methods, and the measures of achievement. In effect, the underlying rationale is that student learning may be enhanced if the teachers' attitudes are positive toward the school's instructional policies and program requirements. Stated another way, if the teacher does not accept the instructional program he or she is responsible for implementing, then student learning may be negatively affected. To our knowledge, no research is presently available to support or refute the merits of this rationale.

- Expectations. The teachers' expectations about student learning is a characteristic that has received considerable attention in the research literature (e.g., Brophy and Good, 1972; Pidgeon, 1970; Rosenthal and Jacobsen, 1968). The basic rationale behind this research is that the teachers' expectations of a student's ability to learn may affect the teachers' behavior in the classroom. As an example, teachers may direct most of their attention and provide the most rewards to students who are expected to be fast learners (Rist, 1973). In the present context, this research suggests that student learning will be facilitated to the extent that the teacher assumes all students in the classroom are capable of mastering the instructional content offered in his or her classroom.

- Expertise. Another teacher characteristic that shows some relationship to student learning is the level of teacher knowledge of the content area he or she is responsible for teaching. The rationale behind this variable is that the teacher who knows reading or math content, for example, is better able to teach it to

students. Some support for this variable can be found in the research that shows relationships between teacher training and student outcomes (e.g., Bidwell and Kasarda, 1975; Goodman, 1959; Hanushek, 1970). Further evidence of the importance of this variable comes from a study comparing high and low performing schools (Delaware Department of Public Instruction, 1977). One characteristic of the teaching staff in the high performing schools seems to be their knowledge of the structure and substance of the subject being taught.

Data on teacher characteristics can be obtained both from administrators and from the teachers themselves. It should be noted, though, that this area is a very sensitive one, particularly for individuals who have a great deal of teaching experience. Thus, information may be difficult to gather.

In any event, the information that is collected might have implications for two different approaches to school improvement. First, it might suggest some of the characteristics that could be used as criteria for selecting new teachers in a particular school. Second, it might indicate the kinds of in-service teacher education programs that could upgrade the skills of the existing staff.

Instructional Integration

A number of different patterns for defining an instructional program can be found in schools throughout the country. In some places, the instructional program is defined in general terms at the school district level, more precise terms at the school level, and considerable detail at the classroom level. In other situations, major responsibility for determining certain aspects of the instructional program is assigned to

different groups (e.g., goals are defined by school district personnel and instructional content by teachers). In still other settings, a committee representing different interest groups assumes a major role in developing a detailed instructional program.

Regardless of how the instructional program is defined or who is assigned responsibility for defining it, the individual classroom teacher is the one who decides what actually will be taught in the classroom. The result is that the instructional content may or may not be closely related to the school's goals. In some cases, it may not even match the teacher's own objectives. Similarly, the instructional content may or may not be related to measures of student outcomes, particularly when standardized or state-wide achievement tests have been selected by the school or school district. Given this situation, one possible explanation for poor student performance on achievement tests is that students were never taught the content related to the goals of instruction, or taught the content on which they were tested.

This analysis suggests that one possible influence on student learning is the level of integration of the instructional program. This factor is defined as the degree of congruence among the goals of instruction, the content of instruction, and the measures of student achievement. Two variables are included under instructional integration:

- Relationship Between Goals and Content. One aspect of instructional integration is the relationship between the stated goals in a particular classroom and the content of the instructional process. That

is, student learning may be enhanced if there is a great deal of overlap between the teacher's goals (regardless of who dictated or influenced this definition of goals) and the content the teacher actually provides to the students in the classroom. This variable may be particularly important if students are aware of the instructional goals and can see the relationships (or lack of relationships) between the goals and the content. While educators tend to view this variable as an important aspect of their educational program, no studies were found in the literature that show a direct relationship between this variable and student learning outcomes.

- Relationship Between Content and Measures. The second aspect of instructional integration is strongly supported by research literature. Cooley and Leinhardt (1975a), for example, stress the importance of teaching students the concepts that are covered on tests used to measure achievement in the classroom. Furthermore, achievement seems to be enhanced if students are taught not only the concepts but also the alternative test item formats that might be used to measure knowledge of the concepts. Rosenshine (1976) reviews a number of other studies that seem to support the same conclusion. He also notes that, while this relationship may appear obvious, it is not uncommon to find instructional programs in schools that have a very low correlation between content and measures.

The third aspect of instructional integration is the relationship between goals and measures. However, a high relationship between goals and measures is assured if the goals are closely related to the content, and the content is highly correlated with the measures. Consequently, this third aspect of instructional integration is not listed as a separate variable.

One simple technique that has been used by researchers to measure the degree of overlap between content and measures involves asking teachers to examine the achievement tests used in their classrooms, and to

indicate whether or not students were taught the concept measured by each item and were familiar with the item format used to test this concept. A similar procedure might be used to study the relationship between a set of goals and the content listed in the teacher's instructional plans. This information would provide another indication of the level of integration of the instructional program in a particular classroom.

Achieving a high level of integration might require changes in the instructional program at the school district, school building, or classroom levels, or all three. For example, depending on the results of the measurement process, a school may decide to use an achievement test that covers more of the instructional content provided by classroom teachers. Or, teachers may change the classroom content to reflect the goals of instruction.

Instructional Organization

The instructional program that is actually delivered to the student at the classroom level may be highly integrated and still be largely ineffective. Some students will fail to learn the material taught in the classroom even when the goals, content, and measures are highly correlated. A number of aspects of the instructional program in addition to integration clearly play an important role in influencing student learning. Some of these aspects can be summarized under the factor labeled instructional organization.

This factor is defined as the extent to which instructional activities in the classroom are focused, structured, and related to student needs.

It includes two variables:

- Structuring of Classroom Activities. In his review of research on classroom instruction, Rosenshine (1976) sees a general pattern of results suggesting the central importance of "direct instruction (sometimes called a structured approach)".* One indication of a structured approach might be the availability of detailed teacher lesson plans for classroom activities with specific instructional objectives, a logical progression of instructional units, frequent monitoring of student progress, and provisions for feedback on student performance. These plans for classroom instructional activities might be developed by the teacher, or adapted from the school's plans, or adopted from published instructional materials. The important point is that the teacher has a structured plan available for use in the classroom.

  The ultimate test of the degree of structure, however, is the activities that are actually implemented in the classroom. Any teacher will readily admit that plans are not always followed. Whatever the reasons for a discrepancy between planned and actual classroom activities, student learning is directly related to the activities students actually experience in the classroom, not to those that reach only the planning stage.

  Finally, the extent to which the plan is continuously modified on the basis of operational classroom experience is still another indication of a structured approach. If the teacher is sensitive to the need to adapt to student characteristics, and changes the plan based on new information about students or actual changes in their behavior, then it is quite likely that student learning will be promoted.

---

* Rosenshine defines "direct instruction" to include not only techniques for focusing and structuring the instructional program, but also a variety of teacher behaviors in the classroom (e.g., teacher use of direct questions) as well as some aspects of the instructional materials used in the classroom. In the present paper, these additional variables are discussed under other factors (i.e., teacher/student interactions and instructional materials).

- Student Placement. Another instructional organization variable that appears to contribute to student learning is the placement of students in individual or group learning activities that are matched to their needs and interests. Cooley and Leinhardt (1975a) include this variable in their model of classroom processes under a broader concept termed "structure." They emphasize two features of the placement or matching variable.

  The first is the use of systematic procedures for assigning students to appropriate learning tasks or groups. That is, a teacher might use test performance data, teacher judgment, student recommendations, progress reports, or other kinds of techniques for assigning students to groups or tasks. Apparently, a combination of systematic procedures is most likely to achieve the best fit between student needs and interests on the one hand and instructional activities on the other. Further, accurate student placement may eventually pay off in terms of increased student learning.

  The second aspect of the placement variable is the frequency of regrouping students on the basis of their progress. There is generally a continuous need for assessing student progress in order to redirect the entire class, to rearrange small groups, or to reassign students to different groups or activities on the basis of recent performance. Again, systematic and multiple procedures for making decisions that result in appropriate student placement at all stages of instruction are desirable.

Measuring the degree of organization at the classroom level can be a difficult and time-consuming effort. The most accurate information can probably be obtained through the examination of teacher lesson plans and the observation of classroom activities. Additional procedures that are somewhat easier to use (but also may be less accurate) include interviews or questionnaires for administrators, teachers, and students. Comparing the opinions or perceptions of these groups regarding degree of structure and use of placement techniques can provide more interesting, and possibly more valid results than considering each group's responses separately.

One caution needs to be mentioned about the concept of instructional organization as it relates to efforts to improve school programs. There is some evidence that there may be wide variation in the degree of structure that is best for different students or tasks. Thus, it cannot be assumed that more structure will lead to increased learning. However, some level of structuring the educational program along the lines suggested above seems to contribute to the learning of most students. This topic is further discussed in the final section of this paper as one recommended area for future research.

Teacher/Student Interactions

Instruction in the classroom involves not only the implementation of an instructional program but also many different kinds of teacher interactions with students. These interactions may be with individual students or groups and they may involve verbal or written exchanges. Some examples of these interactions include: tutoring individual students, lecturing to the entire class, questioning students and responding to their questions, and providing feedback on tests or papers. Some research suggests that certain aspects of these teacher/student interactions contribute to student learning.

This factor is defined as the degree to which teacher/student interactions in the classroom are designed to support and reinforce student learning. Two variables are included under this factor:

- Verbal Interactions. This variable refers to verbal interactions between the teacher and students, either in individual or group settings. Effective interactions appear to involve teacher/student exchanges that are

related to the content of instruction as opposed to non-instructional matters such as discipline or management activities. (These non-instructional interactions are discussed in connection with the time and classroom control variables.) One specific indication of effective interactions that has received considerable support in the research literature is the degree to which the teacher uses direct questions that have an academic focus. Support for this variable can be found in the work of Stallings and Kaskowitz (1974), Brophy and Evertson (1974), and Soar (1973).

A second indication of effective teacher/student interactions is the degree of student participation in these interactions. There are two aspects to degree of participation. The first involves number of students. Teacher interaction with every student rather than with a select group of students may contribute to learning, not only by the participating individuals but also by the entire class. The second aspect of degree of participation concerns the type of exchanges. Active student involvement in content-oriented discussions may be of more value than brief "question-answer" exchanges. Of course, it is very difficult for a teacher to engage in extended discussions with many students on a frequent basis. However, student participation of this kind is a desirable goal and learning of all students in a class may be enhanced to the extent that this goal is achieved. Cooley and Leinhardt (1975a) emphasize its importance.

A third indication of effective teacher/student interactions is the degree to which the teacher interacts with all students regardless of their sex, race, socio-economic status, etc. A deliberate pattern of teacher interaction with certain types of students (and not others) because of their characteristics may be detrimental to learning. For example, a teacher who discusses different content issues with boys and girls may negatively affect the learning of the full class, as well as the learning of individual students.

- Reinforcement Techniques. The effect of various kinds of reinforcement (e.g., praise versus punishment) on student learning has been the focus of a large body of largely inconclusive literature (Dunkin and Biddle, 1974). However, some relatively recent research that concentrates on teacher/student interactions in the classroom provides some plausible hypotheses about teacher

reinforcing behaviors that might contribute to student learning. One basic requirement for student learning is that teachers provide accurate feedback to students on their responses to class questions, tests, and written assignments. Although this variable may appear self-evident, a considerable amount of research indicates that the pattern of teacher reinforcement for correct and incorrect student responses is highly erratic and often inaccurate. Doyle (in press, b) reviews this research in some detail.

Another aspect of reinforcing behavior that is supported by a long history of psychological research is immediacy of feedback. That is, a student who receives immediate feedback on the accuracy of his or her response is more likely to learn than a student who gets delayed feedback. Providing immediate feedback under normal classroom operating conditions may be extremely difficult for teachers. However, it may be possible for teachers to schedule their time to reduce the amount of delay associated with correcting tests and other written work, or to allow more time in class discussions for providing feedback to students on their answers.

The last aspect of this variable deals with the use of positive reinforcement (e.g., praise) for good performance. While research on the use of positive and negative feedback is difficult to interpret (Rosenshine, 1976), some studies do show that positive teacher reactions facilitate student achievement more than minimal or negative reactions (e.g., Friedman, 1973; Hughes, 1973; Rosenfeld, 1972). In general, it would seem beneficial for teachers to reinforce good student performance with positive feedback.

Various techniques can be used to measure the different kinds of teacher/student interactions discussed above. Data on verbal exchanges can be collected by observers or mechanical recording techniques. Data on written exchanges can be gathered by examining teacher-corrected test papers or other written documents that have been submitted by students for review. Some useful data on both verbal and written exchanges can be obtained through the use of simpler procedures such as teacher and student questionnaires or interviews.

Teacher/student interactions are a sensitive area for teachers. Many teachers are hesitant about examining their own exchanges with students and even more concerned about their performance being observed by outsiders. However, the nature of teacher/student interactions seems to be closely related to student performance and, thus, an important area for study. Increased attention should be focused on determining ways to increase teacher cooperation in the collection and use of interaction data.

Classroom Control

To this point, the discussion has focused on variables that might support or encourage student learning. However, every teacher is well aware of a number of conditions that tend to interfere with or discourage student learning. For example, the learning environment in the classroom might be dramatically affected by student discipline problems, disruptions associated with managing the activities or large numbers of students, or even interruptions for school programs or extra-school activities. These conditions obviously do not promote student learning. Rather, it is control of them that seems to be a prerequisite to learning.

Classroom control is defined as the degree to which the classroom environment is organized and operated with a minimum amount of distraction, disruption, and confusion. According to Firestone (1977), the degree of control in the classroom appears to vary according to the techniques used by teachers to evaluate students, to employ sanctions, to structure classroom activities, and to manage those activities. Two variables summarize

these aspects of classroom control:

- Disciplinary Actions. The disciplinary procedures used by the teacher are one technique for controlling the behavior of some students in order to avoid distraction and disruption for the entire class. However, widespread disagreement can be found among educators about a number of discipline issues, such as what kinds of disciplinary procedures should be used, how often, and under what circumstances. An analysis of effective classroom practices by Kounin (1970) and research by Bidwell (1973) provide some guidance about effective disciplinary actions in the classroom. Apparently, control of the classroom is facilitated by: clearly specified definitions of teacher expectations about what constitutes an infraction; the use of fair and consistently applied standards for evaluating student behavior; and firm, dispassionate, and consistent application of disciplinary actions, when necessary.

- Classroom Management Procedures. The management techniques used by the teacher also seem to affect the amount of distraction and confusion in a classroom. Class activities can be structured in a variety of ways, some of which minimize the problems that are a natural consequence of attempting to instruct a large group of students in limited space, while still paying attention to individual student needs and interests. Kounin's (1970) work offers some guidance in this area. Regardless of how discipline is handled, he suggests that student involvement in work activity will increase and disruptive behavior will decrease to the extent that the teacher has established routines for handling student groups. These routines include procedures for becoming aware of and dealing with several issues at the same time, for managing the transition from one activity to another, and for monitoring the behavior of the entire class while focusing on one individual or small group. Similar variables were identified in the work of Evertson and Brophy (1973).

Practically every teacher has problems controlling student behavior at some times. However, most teachers are unable to assess the extent to which these problems may interfere with student learning, or to determine the steps needed to improve the situation. Assessing the problem could be accomplished by collecting various kinds of information, such as

classroom observation reports and questionnaire or interview data from administrators, teachers, students, and parents. If these data indicate a need for improvement, corrective actions might involve changes in the school discipline policy, the organization of schoolwide management systems, or in-service training programs for teachers in classroom management techniques or procedures for dealing with student discipline problems. Another possible solution is involvement of the school principal in facilitating the teacher's efforts to control the classroom behavior of students.

The definition, measurement, and improvement of classroom control variables offer some serious challenges to researchers and educators. Some educators may be strongly opposed to a school improvement philosophy that involves concepts like student control, discipline, or management structures. Also, some teachers are threatened by inquiries into their control of a classroom. Even when there is interest in improving classroom control, doing so is not a simple undertaking. For example, it seems very likely that effective disciplinary procedures, and even management techniques, should vary according to certain characteristics of the students such as their age. Nevertheless, researchers, educators, and the general public are recognizing the central importance of classroom control and the need to take steps to identify problems and organize corrective programs. While the research and experience base in this area is severely limited, some of the work by sociologists on control structures and anthropologists on classroom ecology is beginning to address this critical concern in education today.

Instructional Materials

Most educators assume that student learning is influenced to some degree by the characteristics of the instructional materials used in the classroom. The term "instructional materials" refers to any curriculum programs, textbooks, workbooks, film strips, etc., that are used in the classroom as part of a larger instructional program. Exactly which aspects of these materials tend to influence student learning seems to be a debatable issue for educators and researchers alike.

The instructional materials factor is defined as the extent to which the materials used in the classroom tend to support or motivate student learning. Four variables under this factor are:

- Matching Procedures. Some curriculum programs have provisions for matching students to instructional materials that are suited to their individual needs and interests. For example, pretests may be available for placing students at appropriate levels in the instructional sequence. Matching procedures in the instructional materials may support and strengthen other student placement techniques employed by the teacher or may be the only technique that he or she employs. Student placement, described previously, and matching procedures are, therefore, closely related variables, although the latter is basically a characteristic of the instructional materials and the former is an aspect of the teacher's organization of the larger instructional program.

- Structure of Materials. Structure of materials is closely related to the structuring of activities variable, which was discussed earlier as one aspect of the instructional organization in a classroom. Structuring is primarily a characteristic of the teacher, while the structure of materials variable concerns the materials themselves. In both cases, student learning seems to be enhanced by the use of specific objectives, a clearly defined instructional sequence, f~ uent assessments of student progress,

and feedback to students on their performance. The ease with which the teacher can modify the structure of the materials used in the classroom in order to meet student needs also seems to be important in promoting student learning.

- Diversity of Instructional Techniques. A third characteristic of instructional materials that may affect student learning is the use of different kinds of materials in a single program (e.g., textbook, workbook, film strips). Cooley and Leinhardt (1975a), for example, maintain that a variety of materials may stimulate student interest and eventually motivate learning.

  A related characteristic of instructional materials is the use of alternative modes or methods of instruction (e.g., audio, visual, and print materials) to teach the same concept. This feature of instructional materials provides opportunities for matching materials to the individual learning styles of students. While there is some research support for the notion of matching learning styles to different kinds of instructional treatments, the practical application of this work to classroom situations is still very unclear (Snow, 1977). In any event, the availability of alternative modes of instruction in the materials provides at least an opportunity for experimental efforts in the classroom to match students with appropriate materials. Furthermore, alternative modes for teaching the same concept can be very useful for providing remedial instruction to students.

- Attractiveness of Materials. The attractiveness of the instructional materials is still another characteristic that may be important. This concept has two somewhat different aspects. First, the appearance of the materials (e.g., print, format, color, graphics) may attract and maintain student interest. Second, the use of content that is appropriate for a particular class or group of students depending on their age, environment, or cultural heritage may stimulate learning. The variable is similar in some respects to one proposed by Cooley and Leinhardt (1975a).

Data on the nature of the instructional materials in a classroom can be obtained through an examination of the materials by a curriculum

analyst. Useful information can also be collected through observations of the classroom use of materials or through teacher and student interviews and quesionnaires.

General decisions about which curricula or materials to use in a classroom are typically made at the school district or school level by committees representing administrative and teacher interests. These decisions are often based on practical considerations (e.g., cost, ease of use, teacher training required) as well as educational concerns (e.g., content coverage, relationship of materials to educational goals). While these considerations are certainly important criteria for the selection of new materials, or the continued use of previously selected materials, educators might also pay attention to aspects of the materials, such as those described above, that might result in improved student learning. Of course, the ultimate decision about which curricula are actually used in a classroom is typically made by the individual teacher. Again, the teacher might use a variety of criteria to select materials that will contribute to learning.

Summary and Conclusion

This discussion has focused on twenty variables that may affect student learning. (A chart summarizing these variables, the factors under which they are grouped, and the supporting research is provided in the Appendix.) These variables may have implications for improving the cognitive or basic skills achievement of students, particularly elementary-school students in low SES schools. Thus, they might be viewed as potential target areas for school improvement programs. It should be

emphasized, though, that widespread use of these variables in such programs should await the findings of further research.

The school variables discussed here do not appear to be completely independent concepts and many relationships among them have been identified. Some of these relationships will be discussed in the following section of this paper. Previous analyses have led some researchers to summarize critical instructional features in terms of one or more central concepts, such as Rosenshine's (1976) concept of direct instruction, or Wiley and Harnischfeger's (1974) notion of time, or Coolev and Leinhardt's (1975a) classroom processes constructs. These conceptions may or may not be broad enough to subsume or explain all the variables discussed in this paper.

In any event, the most effective approach for schools seeking to improve their educational programs may not involve a focus on a single underlying concept or a particular variable but rather a broader effort to assess the present status of the local school's instructional program with reference to a number of these variables. Improvement programs might then be organized to strengthen areas of weakness. In effect, improving the underlying pattern of instruction across a number of aspects of the school's program may be more effective than piecemeal efforts to strengthen a particular problem area.

OPERATION OF SCHOOL VARIABLES

In the previous section of this paper, twenty school variables that may influence student learning were described. The operation of these variables in actual school settings is best understood as part of a larger conception of the teaching/learning process in schools. Chart #1 presents one such conception.*

The chart shows that there are at least six distinguishable components of the teaching/learning process that directly or indirectly influence student learning outcomes.** The two components that directly affect what students learn in school are student components (student characteristics and student mental processes). The four components that are indirectly related to student outcomes are educational components (classroom variables, teacher characteristics, school building variables, and school district variables).

Each of the twenty school variables is listed in one of the four educational components in the chart. Most are viewed as classroom variables, since the teacher controls decisions regarding these variables and is responsible for implementing these decisions in the classroom. However, some of the variables are more closely associated with the

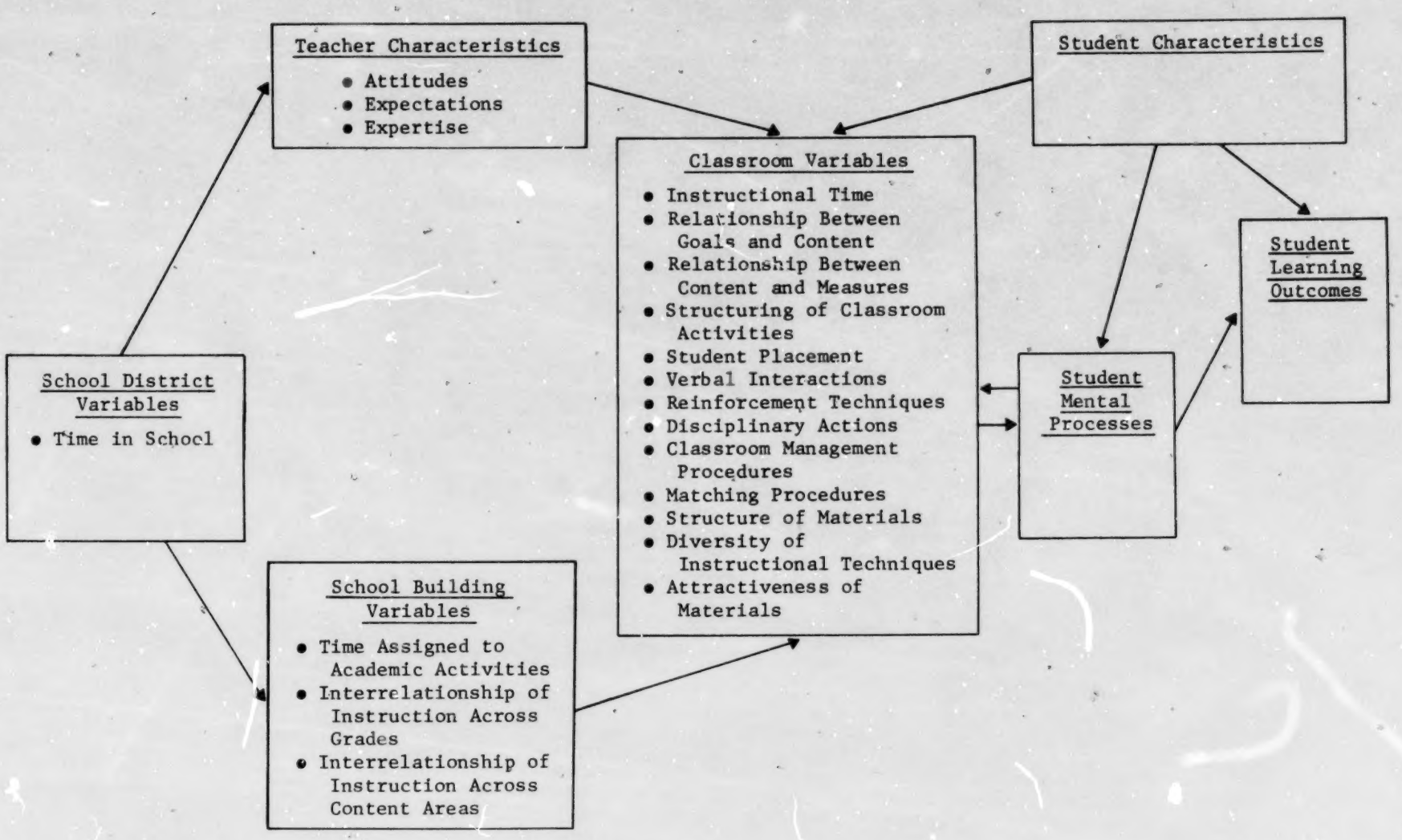
---

* The components indicated in the chart represent a modification of a descriptive model originally proposed by McDonald (1976) and later adapted by Centra and Potter (1977).

** If the conception is broadened to include non-school teaching/learning situations, additional components such as the home, community, and peer group will also play an important role in affecting student learning.

Chart #1

OPERATION OF SCHOOL VARIABLES



decision-making process at the school building or school district levels. Others are clearly characteristics of the teacher.

An example might help to clarify the rationale for placing variables under different components of the school system. The amount of time each teacher spends on instructional activities as opposed to discipline or classroom management activities (i.e., instructional time) is determined in large part by the teacher, and this variable can be observed and measured at the classroom level. In contrast, the amount of time assigned to academic activities as opposed to non-academic activities is typically a decision made at the school building level. Finally, the overall amount of time students spend in school is normally a school district decision.

The present section discusses the role of each of the six components in the teaching/learning process. Student components are described first in order to set the context for discussion of the educational components, the variables associated with these components, and the relationships among variables. Since all of the components influence student learning outcomes, either directly or indirectly, a brief description of outcomes is in order prior to the discussion of components.

Student Learning Outcomes

Student learning outcomes are the ultimate criteria for testing the effects of school variables. Outcomes can include any measurable student performance (e.g., a score on a reading test, a rating on a scale of self-esteem). The outcome that is of concern in this paper is student

achievement in the basic skills. That is, the school variables described previously are viewed as possible influences on what students learn in the basic skills of reading and mathematics. It is quite likely that additional or even different variables would be identified if another student outcome were of interest. For example, if the outcome of interest were student antonomy, then one important variable might be the extent to which independent behavior is encouraged in the classroom.

Student Characteristics

Variations in student characteristics are not dealt with in any detail in this paper, because the focus here is on the instructional or teaching side of the teaching/learning process. However, the knowledge, attitudes, aptitudes, learning styles, and other characteristics that students bring with them to the learning situation are probably the single most important influence on learning outcomes. As indicated in Chart #1, these student characteristics influence learning outcomes directly and also affect student mental processes and even classroom variables.

Student Mental Processes

As Chart #1 shows, student learning outcomes are directly affected by a second component — student mental processes. The student mental processes component is the key vehicle for linking classroom instruction and student learning outcomes. Aspects of the instructional program at the classroom level affect student mental processes, which are then translated into student performance on some outcome measure. Cognitive

psychologists (e.g., Carroll, 1976) are examining these mental processes and their relationship to classroom variables on the one side and learning outcomes on the other.

To clarify this relationship, it might be useful to speculate about how student cognitive processes might be affected by one of the classroom variables and, in turn, influence learning. Mayer (1977) has generated a taxonomy of internal student information-processing stages that includes three initial student mental operations: motivational processes, attentional processes, and rehearsal processes. He argues that the instructional variables most likely to affect these processes are rate of presentation, amount of practice, drill, and feedback, etc. A classroom variable such as structuring of classroom activities may contribute to student learning outcomes because it provides students with more opportunities for practice, drill, and feedback.

Another relationship noted in Chart #1 concerns the effects of student mental processes on classroom variables. Not only do classroom variables influence mental processes, but the reverse is also true. Haller's (1967) work, for example, suggests that students' reactions affect the teacher's pattern of speech.

The role of student mental processes in the teaching/learning process is an important topic that is considered further in the final section of this paper. A better understanding of student mental processes might suggest guidelines for teaching different content, different skills, and even different kinds of students.

Classroom Variables

Thirteen of the twenty school variables described in this paper are listed in Chart #1 as examples of classroom variables. This suggests that most of the school variables that affect student learning are more accurately termed classroom variables. Certainly, it is clear that the classroom is the point at which students and instruction interact and, thus, a component that one would expect to be well represented in any effort aimed at identifying important school influences on student learning. However, it is important to point out that what happens in the classroom may be significantly influenced by school building and school district variables. Since these relationships are not well understood, the importance of school building and school district variables may be underestimated in the present list of school variables.

Classroom variables, as noted earlier, influence student mental processes, which are then translated into outcomes. In addition, there are important relationships among the classroom variables themselves. As an example, the matching procedures included in the curriculum may be one of the techniques teachers use for student placement. Also, the effectiveness of the classroom management procedures will, in part, determine the amount of instructional time available. The relationship among variables at a particular level of the school system such as the classroom, as well as the relationship among variables at different levels, is also an important topic to be considered later in this paper.

Teacher Characteristics

The characteristics of the teacher (i.e., attitudes, expectations, expertise) represent a strong influence on instructional conditions at the classroom level. Teacher attitudes toward the instructional program, for example, might affect such classroom variables as the relationship among instructional goals, content, and measures, and the management procedures followed in the classroom. Similarly, teacher expectations about student success may influence his or her verbal interactions with students in the classroom. Further, the level of teacher expertise in a particular content area might affect a number of classroom variables, including structuring of classroom activities and student placement.

Additional teacher characteristics that might affect classroom teaching behaviors are identified in a number of research reports. For example, McDonald (1976) found a significant relationship between four teacher aptitude variables (Verbal Fluency, Memory, Reasoning, and Flexibility) and teacher classroom behaviors, which, in turn, were significantly related to student gain. Other teacher aptitude, attitude, knowledge, or experience variables are discussed in the voluminous research on teacher effectiveness (Travers, 1973).

School Building Variables

The school building plays a major role in the educational process. Both administrative and instructional decisions are made at the building level, including decisions related to time and the articulation of instruction. Therefore, three variables are listed in Chart #1 as

examples of school building variables: time assigned to academic activities, interrelationship of instruction across grades, and interrelationship of instruction across content areas. Other possible influences on student outcomes that may warrant consideration include authority structures, reward systems, and school climate.

School building variables, like teacher characteristics, are important influences on classroom instruction. For example, the amount of time assigned to academic activities sets limits on the amount of time the teacher can devote to instruction in the classroom. Moreover, the degree of articulation of the instructional program at the school level may influence the relationship among goals, content, and measures at the classroom level, the structuring of student activities, student placement, etc.

School District Variables

The school district is another conponent that has an established role in the educational process. In addition to its administrative functions (e.g., personnel, budgeting), the school district usually has responsibility for some instructional activities such as preparing curriculum guides, organizing staff development programs, and setting educational goals and priorities. The school district is also responsible (within the limits set by state mandates) for decision making related to the amount of time that students spend in school over the course of any given school year. Therefore, time in school is listed in Chart #1 as one example of a school district variable that may affect student learning.

Research on school effects suggests that many other variables at the school district level may also contribute to learning. Centra and Potter (1977), for example, review some studies suggesting other school district conditions, such as school size, fiscal resources, pupil-teacher ratio, and average class size, that may influence student learning. Firestone (1977) offers some evidence to support a similar set of school district variables: pupil-teacher ratio, administrator-teacher ratio, and expenditures. Further exploration of these variables may indicate that they, too, have educational utility and, thus, should be added to the present list.

School district variables would seem to influence the variables in two other components shown in Chart #1. On the one hand, school district policies and procedures may have a significant effect on the characteristics of teachers who are employed by the school system. As an example, the nature and number of teacher training programs that are conducted by the school district may affect the expertise or attitudes of the teaching staff. On the other hand, school district conditions may affect variables at the school building level in some important ways. For instance, decisions about the overall amount of time provided in a school year should affect the amount of time that each school building assigns to academic activities.

This analysis of the operation of school variables obviously covers a complex area in a very superficial manner. However, viewing school variables in this broader context emphasizes two critical points. First,

the twenty variables listed here are only a small part of a larger number of conditions or processes at all levels of the educational system that may affect student learning. Second, much additional research is needed to clarify important variables and the relationships among them. Toward this end, a program of research is suggested in the next and perhaps the most important section of this paper.

IMPLICATIONS FOR RESEARCH

The school variables discussed in previous sections are viewed as aspects of an instructional program that might affect student learning. In our judgment, the existing support in the research literature and the educational utility of these variables are sufficient justification for their use in pilot efforts to improve school programs. Widespread use of these variables requires further research, especially in areas where our knowledge is extremely limited.

The purpose of this section is to describe research studies that are needed to add to existing knowledge about school variables that might affect student learning. Essentially what is proposed is that our preliminary description of school variables and how they function in the teaching/learning situation be tested and revised in a continuing program of field research. A description of the overall research strategy to be employed is presented first. Some of the research studies that might be conducted using this strategy are then discussed.

Research Strategy

A number of different kinds of research programs might add to existing knowledge about school conditions that affect student learning. There are many examples of significant experimental research studies that might be used as models for further research in this area (e.g., Cooley and Leinhardt, 1975b; McDonald, 1976; Soar, 1973). While studies of this type have contributed to knowledge in the past and will continue to do so in the future, the proposed research program is designed to

supplement these large-scale experimental efforts with a more intensive analysis of school variables affecting student learning.

A need for in-depth understanding of the nature and operation of school variables in specific school sites has been expressed by some critics of the state of the existing knowledge base in school effects research (Barr and Dreeben, in press; Spady, 1976). A basic problem in previous work appears to be that any generalizations about the effectiveness of school variables are subject to considerable error, since the impact of any school variable seems to be strongly influenced by characteristics of the school or teaching staff, content variations, the nature of the learning task, or characteristics of the students themselves. Acknowledging this problem, some researchers have questioned the utility of studies designed to test the broad impact of instructional treatments on student learning and suggested that very specific studies of individual school and classroom situations might be a more productive approach, at least in the immediate future (e.g., Fisher and Berliner, 1977; Snow, 1977). The purpose of these studies would be to develop a better knowledge base about the nature of the teaching/learning process in a small sample of school sites before developing general theories of learning and instruction that might apply to a large number of students and schools.

A basic feature of the proposed research strategy is its focus on intensive study in a small number of school sites for the purpose of contributing to knowledge. In addition, the strategy involves cooperative work with educators in planned intervention efforts to improve their educational program. This approach would then have the dual objectives

of generating knowledge while helping school personnel. The research and intervention process would be designed to be compatible and even mutually reinforcing.

The intervention or helping process might involve: developing measures of the status of a specific school's program with reference to the school variables discussed previously, and helping a school to strengthen aspects of its educational program that appear to be problem areas. The research or knowledge generating process might involve: describing the variables in a particular situation, studying the impact of the context on the nature and operation of these variables, analyzing the relationships among variables, collecting data on the nature and extent of program changes with reference to these variables, and testing the impact of program changes on student learning outcomes.

One or more schools that are interested in participating in a pilot effort to improve their educational program would be included in the proposed research program. Particular classrooms in each school (e.g., all reading classes, the entire fifth grade) would serve as the focus for the study. Although the basic unit of analysis would be the individual classroom, data would be collected not only on classroom variables but also on school and school district variables and on teacher characteristics in each school site.

The generalizability of the results of these specific studies of individual classroom and school situations is a critical problem. Two different kinds of generalizations are involved. The first is generalizations about the operation and effects of school variables in the same

situation across different points in time. Since classroom interactions of teachers, students, tasks, and materials are a highly complex phenomenon that can change dramatically even over short periods of time, repeated measures of variables and their effects on student learning in a particular site are necessary in order to ensure the reliability of the results.

Generalizations from one classroom or school to another are also a matter of serious concern, given that only a small sample of schools or classrooms would participate in these studies. However, it may be possible over time to cluster sites in which conditions and effects were similar so as to support a within-cluster generalization that might apply to other sites having similar characteristics. Generalizations of this type might be facilitated by selecting the participating classroom and school sites according to a clustering scheme of some kind.

Perhaps the real answer to the problem of generalization to other sites is that the proposed studies are not designed to reach generalizable conclusions. Their purpose is to discover important relationships rather than to test hypotheses. The results of these studies need to be cross-validated in large-scale experimental studies at a later date. Moreover, the findings of either large- or small-scale studies may not apply to the unique conditions and circumstances in a given school. Local evaluation may be required in each new site to identify which of these variables, if any, have significant effects on student learning.

In summary, the important features of the overall strategy are a concentration on building a base of knowledge about the nature and operation of a specific set of school variables in cooperation with a

small number of school and classroom sites as part of a planned intervention effort. Fisher and Berliner (1977) have argued that this kind of "quasi-clinical inquiry" in research on classroom teaching and learning is an important addition to conventional research techniques. They distinguish this approach from conventional research techniques by highlighting its basic features: the holistic view of the classroom and school situations; the intensive study of single classrooms; the use of repeated measures in conjunction with planned interventions; and the dual objectives of generating knowledge while in a helping relationship with school personnel. A similar point of view is expressed by Bronfenbrenner (1976) who argues for research in real-life educational settings in addition to laboratory situations; study of the relations between learners and their environments (ecology of education); and efforts to change the environment (or the learner) in order to discover relationships between the learner and his or her environment.

Research Studies

The research strategy outlined above provides opportunities for contributing to knowledge with reference to at least three broad issues: definition of variables, effects of variables, and operation of variables. Research studies that might contribute to knowledge in each area are discussed below.

Definition of Variables. The definitions of variables discussed in previous sections were developed on the basis of a review of the relevant research literature and field experience with educators in school improvement programs. These definitions are preliminary descriptions of some

important aspects of an educational program that might be targets for school improvement efforts. However, the definitions need to be revised in light of a systematic effort to collect descriptive information about these variables in school settings.

While the research literature is helpful in defining variables, a great deal of work remains to be done in this area. Rosenshine (1976) has noted that the same or very similar concepts have been labelled, defined, and measured in many different ways in research studies. Using an example from the variables we have identified, even a relatively simple school variable such as "total time in school" might be defined as the total amount of scheduled school time or the amount of time actually provided. Defining more complex concepts such as integration, structure, or control can be even more arbitrary and idiosyncratic.

Descriptive information collected in a small sample of schools might supply a base of knowledge to be used in developing accurate, comprehensive, and generalizable definitions that reflect the operational conditions in schools. This information might also be useful in developing measures of the variables. Some of the relevant questions might be: Do these definitions accurately represent the actual events that occur in schools? Do they encompass all important aspects of the larger concept? Does the same definition apply to different schools?

Developing accurate definitions and measures of school variables requires not only information on the nature of the variables themselves but also a broader understanding of the context in which these variables operate. Some anthropologists (McDermott, 1974), sociologists (Barr

and Dreeben, in press), and psychologists (Cronbach, 1975) argue that knowledge of the specific school context is critically important in order to understand the nature and meaning of instruction. Some relevant questions about the school context might be: How does the context shape or define these variables? How do the people in this situation perceive or define these variables? Do their perceptions and definitions differ substantially? Are they consistent with the reality of the situation? Who is responsible for decisions or actions with reference to these variables? How are decisions made and what process is used to communicate or implement these decisions? What social factors influence the decision-making or implementation process?

Descriptive studies might focus on one or more factors (e.g., time) and associated variables in a specific school district, school building, and classroom setting. Since the variables under study involve many different kinds of processes related to instruction (e.g., teacher/student interactions, decision making regarding which curricula to use, preparation of teacher lesson plans), a variety of techniques are required to describe these variables. These techniques might include classroom observation, teacher/student interviews, review of the minutes of school or school district meetings, inspection of lesson plans, analyses of curricula, etc. The larger effort to describe the classroom, school, or school district context in which variables operate might use such methodologies as clinical research methods, ethnographic approaches, interaction analysis, case study methods, and social research techniques.

The important outcomes of descriptive studies in this area might be not only new definitions of school variables and improved measures of these variables, but also the identification of additional variables or factors. As an example, observations of classroom activities may indicate that teachers frequently encourage students who have mastered a particular skill to help students who are having difficulty with that skill. As a result of these observations, work might be initiated to explore the possibility of adding a new variable to the list of variables already identified as potentially important. That variable might be termed "extent to which peer tutoring is encouraged."

Effects of Variables. Whatever definitions and measures of school variables are used, the impact of these variables on student learning must be tested. In effect, we need to ask if changes in variables such as increasing the amount of instructional time, or providing more structure for the program, or strengthening program integration will result in increased student learning. Again, it is recommended that a small number of sites involved in cooperative efforts to improve school programs be the focus of study. Not only will it be possible to identify the impact of particular variables on student learning at these sites, but opportunities will be available to carry out research that is often impractical in large-scale experimental efforts.

As an example, one issue that might be studied is the level or range of effectiveness of school variables in operational settings. Improving certain variables may result in increased student learning only up to a

point. Beyond this point, changes may have no effect on student learning or even a negative effect. In a school site, a small increase in the amount of structure in a particular school program may increase student learning. However, as more and more structure is introduced into the program, the instructional process may become too mechanical, fail to motivate students, and eventually lead to less student learning. Both Spady (1976) and Soar and Soar (1976) have called attention to the possibility of "ceiling effects" or limits in the levels of effectiveness of variables like structure.

Another issue that might be examined in the proposed studies of effects is the school conditions that influence the impact of variables. A different pattern of high and low performance on certain variables may be more effective for different schools depending on variations in the characteristics of the school or the instructional staff. For example, a classroom in a school with a low per-pupil expenditure level and an inexperienced teacher may be more effective in increasing student learning if the educational program is highly structured. On the other hand, a classroom in a school with a high per-pupil expenditure level and a relatively experienced teacher may need a less structured program. This analysis suggests a long-range possibility of developing "school profiles" on particular variables for different kinds of schools.

Still another issue that might be considered in studies of school variables is variations in effects depending on the nature of the learning task, or the content of the instructional process, or characteristics

of the students themselves. One pattern of instruction may be most effective for rote learning processes while another may prove more effective for advanced skills. Similarly, the pattern of instruction may differ for reading or mathematics content, or for students in the third grade as compared with the fifth grade. In fact, McDonald's (1976) study of instructional factors in the California schools isolated different patterns of teaching effectiveness for different content areas and different grade levels.

The procedures for examining these research issues would involve the collection of three different kinds of data in each school site. The first is site-specific descriptions of classroom conditions. Since the basic unit of analysis is the individual classroom, data would be collected on the nature and operation of the variable or variables of interest in each classroom. In addition, descriptive data would be collected on context factors such as the nature of the learning tasks, the decision-making process involved in assigning those tasks, the overall classroom climate, and social interactions among students. These data are similar in many respects to the descriptive data discussed above and might be collected at the same time information is gathered for use in defining variables and describing classroom conditions.

The second dataset needed for assessing the effectiveness of school variables concerns the nature and extent of the program changes made with reference to these variables in the classroom situation. These data are important since we need to know how much change was introduced into the classroom program. The third dataset is the level of student performance before and after changes were made.

The overall analysis of these data would essentially involve testing the extent to which changes in the same variable across different classrooms resulted in increased student performance. However, the descriptive information on each classroom would allow further analyses of these data to determine differences in student performance that might be related to classroom conditions such as grade levels, or content areas, or the nature of the task under study. Moreover, differences in the level of student improvement could be examined in relationship to the extent of program changes in the various classrooms.

The outcomes of this analysis would be an indication of the effects of particular variables in a small sample of classrooms and schools. Also, some site-specific information about the levels and conditions of effectiveness would result.

Operation of Variables. In a previous section, the operation of school variables was described using a chart showing the various components of the teaching/learning process in schools and the relationships among these components (see Chart #1). The structure suggests a number of gaps in the existing base of knowledge about how these variables might affect student learning. In particular, further research in this area might be designed to contribute to knowledge about the relationships among school variables, and the interactions between these variables and student characteristics.

Very little is known about the relationships among these variables across different levels of the educational system: how school district

variables affect teacher characteristics and school building conditions, and how school building conditions and teacher characteristics influence classroom processes. Most school effects research has investigated the effects on student learning of such school district or school variables as pupil-teacher ratios, size of school or district, total fiscal resources, etc. One problem with this body of research according to Cooley and Lohnes (1976) is that school district or school variables have only an indirect influence on student learning outcomes. Their direct influence is on classroom instructional processes that, in turn, affect student learning.

Perhaps a more productive approach to further research on school effects might be to trace the impact of school district variables on teacher characteristics, or school building variables, or classroom variables rather than on student learning outcomes. For example, the relationship between a school district variable such as time in school might be studied in terms of its influence on time assigned to academic activities within a school building or instructional time within a classroom. Research of this kind would be very useful not only for identifying the variables that may influence classroom processes, but also for contributing to an understanding of how these variables eventually influence student learning outcomes.

A related issue is the lack of knowledge about the interactions among variables at a particular level of the school system. For example, classroom discipline practices may affect the amount of instructional

time, or the nature of teacher/student interactions, or classroom management procedures. A basic understanding of these interactions would provide a much clearer picture of the nature of the instructional process and the relative importance of particular variables.

The procedures for testing relationships among variables across levels of the educational system or within a particular level might involve two steps. First, the descriptive information discussed above about the nature and operation of variables at each level of the system might be analyzed to develop predictions about how certain practices or variables at one level of the system might influence activities at another level. Second, the accuracy of these predictions might be tested in a second sample of school sites.

The interaction between classroom variables and student characteristics is another gap in existing knowledge. Perhaps the key linkage in the teaching/learning process is between classroom instructional treatments on the one hand and student mental processes on the other. A basic understanding of what is happening in students' minds (i.e., their mental processes) as a result of exposure to different kinds of instructional treatments might represent a significant contribution to knowledge of how classroom variables affect learning outcomes. Some significant work in this area was cited previously (i.e., Carroll, 1976; Mayer, 1977).

A related problem is the interactions between different kinds of instructional treatments and variations in student characteristics (i.e., aptitude-treatment interactions). Recently, Snow (1977) has

argued that the path to increased understanding of aptitude-treatment interactions (ATI's) requires research in operational school sites:

> Individual difference variables operating in ATI show the essential importance of detailed description of both specific instructional situations and specific groups of people. And information processing approaches provide a means of analyzing both specific situation and specific person variables. But the kind of theories that come out of this are quite specific, limited in both time and place. These are theories that apply to the teaching of arithmetic in grades 1-2-3 in Washington and Lincoln schools in Little City, but perhaps not to the two other elementary schools in that town; to a course in economics in a particular private high school; or to a two-week social studies unit on alienation in a Central City junior high school. The research that is done at this level is close to what would ordinarily be called "formative evaluation," and seems consistent with Cronbach's (1975) emphasis on local description. But it isn't just that. It would include iterative attempts at instructional development and information processing experiments designed to analyze learning tasks as well, all conducted on site. (p. 12)

The research strategy outlined here would provide one vehicle for small experimental studies of the interactions between classroom variables (instructional treatments) and either student mental processes or other student characteristics. Since the previously cited researchers have provided examples of the kinds of research that might be conducted, there is no need to elaborate on the procedures to be used in such studies. The important point to be emphasized here is that small-scale experimental research in particular school and classroom settings with detailed descriptive information on both specific instructional situations and specific groups of people may be a useful direction for future research.

Some additional areas of needed research on the interactions between instructional variables and student learning might simply be noted. Doyle (in press, a) points to a growing body of evidence that students have a significant impact on determining the ways that teachers behave in the classroom. He suggests a need for more attention to determine how student/teacher "reciprocity" moderates the effects of classroom variables. Also, it is clear that whatever is learned by the student is ultimately translated into some observable measure of knowledge or performance such as a score on a test. Yet very little is known about the relationships between the mental processes the student employs to learn facts, concepts, or principles in the classroom and the mental operations required to demonstrate this learning on a test of some kind.

In summary, the research studies proposed here will contribute to an understanding of school variables that are important influences on student learning. The results of these studies will also be of use in ongoing improvement efforts at sites where the research was conducted. In addition, they will have implications both for further research undertakings and for school improvement programs at other sites.

REFERENCES

Averch, H. A., Carroll, S. J., Donaldson, T. S., Kiesling, H. J., & Pincus, J. How effective is schooling? A critical review and synthesis of research findings. Santa Monica, Ca.: Rand Corporation, 1972.

Barr, R., & Dreeben, R. Instruction in classrooms. In L. S. Shulman (Ed.), Review of research in education 5. Itasca, Ill.: F. E. Peacock, in press.

Berliner, D. C. Impediments to the study of teacher effectiveness. Journal of Teacher Education, 1976, 27, 5-13.

Bidwell, C. The social psychology of teaching. In R. M. W. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally, 1973.

Bidwell, C. E., & Kasarda, J. E. School district organization and student achievement. American Sociological Review, 1975, 40, 55-70.

Bloom, B. S. Time and learning. American Psychologist, 1974, 29, 682-688.

Bond, G. L., & Dykstra, R. The Cooperative Research Program in First-Grade Reading Instruction. Reading Research Quarterly, 1967, 2(4), 5-142.

Bronfenbrenner, U. The experimental ecology of education. Educational Researcher, 1976, 78, 5-15.

Brophy, J. E., & Evertson, C. M. Process-product correlations in the Texas Teacher Effectiveness Study: Final report. Austin: University of Texas, Research and Development Center for Teacher Education, 1974.

Brophy, J., & Good T. Teacher expectations: Beyond the Pygmalion controversy. Phi Delta Kappan, 1972, 54, 276-278.

Carroll, J. B. A model for school learning. Teachers College Record, 1963, 64, 723-733.

Carroll, J. B. Psychometric tests as cognitive tasks: A new "structure of intellect." In L. B. Resnick (Ed.), The nature of intelligence. Hillsdale, N. J.: Erlbaum, 1976.

Centra, J. A., & Potter, D. A. School and teacher variables influencing student achievement. Unpublished manuscript, 1977.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. L. Equality of educational opportunity. Washington, D. C.: U. S. Government Printing Office, 1966.

Comber, L. C., & Keeves, J. P. Science education in nineteen countries. New York: Wiley, 1973.

Cooley, W. W., & Leinhardt, G. The application of a model for investigating classroom processes. Pittsburgh: University of Pittsburgh, Learning Research and Development Center, 1975. (a)

Cooley, W. W., & Leinhardt, G. Design for the Individualized Instruction Study: A study of the effectiveness of individualized instruction in the teaching of reading and mathematics in compensatory education programs. Pittsburgh: University of Pittsburgh, Learning Research and Development Center, 1975. (b)

Cooley, W. W., & Lohnes, P. R. Evaluation research in education. New York: Irvington Publishers, 1976.

Cronbach, L. J. Beyond the two disciplines of scientific psychology. American Psychologist, 1975, 30, 116-127.

Delaware Department of Public Instruction. Delaware Educational Accountability case studies: Elementary schools, grades 1-4 (a report of results). Dover, Del.: DPI, 1977.

Doyle, W. Classroom tasks and student abilities. In P. L. Peterson & H. J. Walberg (Eds.), Conceptions of teaching. Berkeley, Ca.: McCutchan, in press. (a)

Doyle, W. Paradigms for research on teacher effectiveness. In L. S. Shulman (Ed.), Review of research in education 5. Itasca, Ill.: F. E. Peacock, in press. (b)

Dunkin, M. J., & Biddle, B. J. The study of teaching. New York: Holt, Reinhart and Winston, 1974.

Etzioni, A. Two approaches to organizational analysis: A critique and a suggestion. Administrative Science Quarterly, 1960, 5, 257-278.

Evertson, C. M., & Brophy, J. E. High-inference behavioral ratings as correlates of teaching effectiveness. Austin: University of Texas, Research and Development Center for Teacher Education, 1973.

Firestone, W. A. Control issues affecting the management of student learning. Unpublished manuscript, 1977.

Fisher, C. W., & Berliner, D. C. Quasi-clinical inquiry in research on classroom teaching and learning. Paper presented at the annual meeting of the American Educational Research Association, New York, 1977.

Friedman, P. The relationship of teacher reinforcement to spontaneous student verbalization within the classroom. Journal of Educational Psychology, 1973, 65, 59-64.

Goodman, S. M. The assessment of school quality. Albany: State Education Department of New York, 1959.

Haller, E. Pupil influence in teacher socialization: A sociolinguistic study. Sociology of Education, 1967, 40, 316-333.

Hanushek, E. The production of education, teacher quality, and efficiency. Do teachers make a difference? Washington, D. C.: U. S. Government Printing Office, 1970.

Hughes, D. C. An experimental investigation of the effects of pupil responding and teacher reacting on pupil achievement. American Educational Research Journal, 1973, 10, 21-37.

Husen, T. (Ed.) International study of achievement in mathematics: A comparison of twelve countries (Vol. 2). New York: Wiley, 1967.

Kounin, J. S. Discipline and group management in classrooms. New York: Holt, Rinehart and Winston, 1970.

LeCompte, M. Learning to work: The hidden curriculum of the classroom. Anthropology and Education Quarterly, in press.

Mayer, R. E. An information processing approach to school learning outcomes. Unpublished manuscript, 1977.

Mayeske, G. W., Wisler, C. E., Beaton, A. E., Jr., Weinfeld, F. D., Cohen, W. M., Okada, T., Proshek, J. M., & Tabler, K. A. A study of our nation's schools. Washington, D. C.: U. S. Government Printing Office, 1969.

McDermott, R. P. Achieving school failure: An anthropological approach to illiteracy and social stratification. In G. D. Spindler (Ed.), Education and cultural process. New York: Holt, Rinehart and Winston, 1974.

McDonald, F. J. Executive summary report: Beginning teacher evaluation study, Phase II. Princeton, N. J.: Educational Testing Service, 1976.

Pidgeon, D. A. Expectation and pupil performance. Slough, England: National Foundation for Educational Research in England and Wales, 1970.

Rist, R. C. The urban school: A factory of failure. Cambridge, Mass.: MIT Press, 1973.

Rosenfeld, G. W. Some effects of reinforcement on achievement and behavior in a regular classroom. Variables Educational Psychology, 1972, 63, 189-193.

Rosenshine, B. Teaching behaviors and student achievement. London: National Foundation for Educational Research in England and Wales, 1971.

Rosenshine, B. Classroom instruction. In N. L. Gage (Ed.), The psychology of teaching methods. Seventh-fifth Yearbook of the National Society for the Study of Education (Pt. 1). Chicago: University of Chicago Press, 1976.

Rosenthal, R., & L. Jacobsen. Pygmalion in the classroom. New York: Holt, Rinehart and Winston, 1968.

Snow, R. E. Individual differences and instructional theory. Educational Researcher, 1977, 6(10), 11-15.

Soar, R. S. Follow Through classroom process measurement and pupil growth: Final report. Gainesville, Fla.: University of Florida, College of Education, 1973.

Soar, R. S., & Soar, R. M. An attempt to identify measures of teacher effectiveness from four studies. Journal of Research in Teacher Education, 1976, 27(3), 261-266.

Spady, W. G. The impact of school resources on students. In W. H. Sewell, R. M. Hauser, & D. L. Featherman (Eds.), School and achievement in American society. New York: Academic Press, 1976.

Stallings, J. A. Follow Through program classroom observation evaluation 1971-72. Menlo Park, Ca.: Stanford Research Institute, 1973.

Stallings, J. A., & Kaskowitz, D. H. Follow Through classroom observation evaluation 1972-73. Menlo Park, Ca.: Stanford Research Institute, 1974.

Travers, R. M. W. (Ed.) Second handbook of research on teaching. Chicago: Rand McNally, 1973.

Walker, D. F., & Schaffarzick, J. Comparing curricula. Review of Educational Research, 1974, 44, 83-111.

Wiley, D. E., & Harnischfeger, A. Explosion of a myth: Quantity of schooling and exposure to instruction, major educational vehicles. Educational Researcher, 1974, 3, 7-12.

APPENDIX

Table 2-4
SCHOOL VARIABLES AFFECTING STUDENT LEARNING

Factor		Supporting Research
Time. The extent to which time is used as a resource to provide maximum opportunity for student learning.	• Time in School. Total number of hours of schooling provided in a school year.	Wiley & Harnischfeger (1974)
	• Time Assigned to Academic Activities. Amount of time assigned to academic subjects as compared with non-academic subjects.	Stallings & Kaskowitz (1974)
	• Instructional Time. Amount of time teachers spend on instructional activities.	LeCompte (in press), McDonald (1976).
Instructional Articulation. The extent to which instruction in one grade level or content area supports instruction in other grade levels or content areas.	• Interrelationship of Instruction Across Grades. The existence of a school-wide plan for instruction across various grade levels in the school, the extent to which the plan for one grade level provides opportunities for reinforcing and building on previous instruction and laying the foundation for subsequent instruction, and the level of teacher awareness and use of the content of the plan.	
	• Interrelationship of Instruction Across Content Areas. The extent to which provisions are made for reinforcing the development of certain skills (e.g., reading) in different content areas at the same grade level.	
Teacher Characteristics. The degree to which the attitudes, expectations, and expertise of the teaching staff tend to facilitate student learning.	• Attitudes. Extent of teacher agreement with the overall philosophy of the school, the goals of instruction, the instructional content, and the measures of achievement.	
	• Expectations. Extent of teacher expectations for successful mastery of the instructional content by all students.	Pidgeon (1970), Rosenthal & Jacobsen (1968), Brophy & Good (1972).
	• Expertise. Extent of teacher knowledge of the structure and substance of the content area being taught.	Goodman (1959), Bidwell & Kasarda (1975), Hanushek (1970), Delaware Department of Public Instruction (1977).

Instructional Integration. The degree of congruence among the goals of instruction, the content of instruction, and the measures of student achievement.	• Relationship Between Goals and Content. Degree of overlap between the stated goals of a particular content area and the content of the instructional process.	
	• Relationship Between Content and Measures. Degree of overlap between the content of instruction in a particular subject-matter area and the achievement tests used to measure student outcomes.	Walker & Schaffarzick (1974), Husen (1967), Comber & Keeves (1973).
Instructional Organization. The extent to which classroom instructional activities are focused, structured, and related to student needs.	• Structuring of Classroom Activities. The existence of an instructional plan with specific instructional objectives, a logical progression of instructional units, frequent monitoring of student progress, and provisions for feedback on student performance. And, the extent to which the instructional plan is used in the classroom, and modified on the basis of continuing experience.	Rosenshine (1976)
	• Student Placement. The use of multiple and systematic procedures for placing students in appropriate individual or group learning activities, and the frequency of regrouping students on the basis of their learning progress.	Cooley & Leinhardt (1975a), Berliner (1976).
Teacher/Student Interactions. The degree to which teacher/student interactions in the classroom are designed to support and reinforce the learning of all students.	• Verbal Interactions. The number of verbal interactions that are related to content, the degree of student participation in these interactions, and the degree to which the teacher interacts with all students regardless of sex, race, socio-economic status, etc.	Stallings & Kaskowitz (1974), Brophy & Evertson (1974), Soar (1973).
	• Reinforcement Techniques. The extent to which accurate and immediate feedback is given to students on their performance, and the extent to which positive reinforcement (e.g., praise) is used for good performance.	Doyle (in press, b), Rosenfeld (1972), Friedman (1973), Hughes (1973).

Classroom Control. The degree to which the classroom environment is organized and operated with a minimum amount of distraction, disruption, and confusion.	• Disciplinary Actions. The extent to which expectations and infractions are clearly specified, standards for evaluating student behavior are viewed as fair and consistent, and disciplinary actions, when necessary, are applied firmly, dispassionately, and consistently.	Kounin (1970), Bidwell (1973).
	• Classroom Management Procedures. Use of established routines for handling groups of students, including procedures for dealing with several issues at the same time, managing the transition from one activity to another, and monitoring the class while focusing on one individual or small group.	Evertson & Brophy (1973), Kounin (1970).
Instructional Materials. The extent to which the instructional materials used in the classroom support and motivate student learning.	• Matching Procedures. The availability of procedures for matching students to instructional content that is suited to their interests and needs.	Cooley & Leinhardt (1975a), Berliner (1976).
	• Structure of Materials. The specificity of objectives, clarity of the instructional sequence, ease of modifying the sequence, frequency of assessments of student progress, and adequacy of feedback to students on their performance.	Rosenshine (1976)
	• Diversity of Instructional Techniques. The availability of alternative modes of instruction (e.g., textbook, workbook, film strips) to maintain student interest and accommodate to individual learning styles.	Cooley & Leinhardt (1975a)
	• Attractiveness of Materials. The extent to which the materials are attractively designed (format, color, graphics), and use content that is matched to the interests of students.	Cooley & Leinhardt (1975a)